

Canadian Mineral Exploration and Discovery Analysis

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CANADA'S STANDING AS AN EXPLORATION TARGET

For the purpose of this article, statistics that were current in May 2003 will be used. Hence, the 2001 total for exploration and deposit appraisal expenditures was \$512.9 million, the preliminary total for 2002 was \$534.1 million, and company spending intentions for 2003 totaled \$574 million. However, an August 2003 statistical update reveals that exploration and deposit appraisal expenditures in Canada for the non-petroleum minerals industry actually totaled \$508.9 million in 2001. The new total for exploration spending in 2002 is \$573.4 million and company spending intentions for 2003 now total \$684 million.

The annual survey of world mineral exploration intentions by the Metals Economics Group (MEG) for 2002 indicates that, in 2002, exploration expenditures in Canada (US\$317.1 million) appear to have exceeded those in Australia (US\$304.4 million). Canada has not been ahead of Australia in terms of mineral exploration expenditures since 1991 (Figure 1). The MEG survey puts the United States in third place in 2002 (US\$125.2 million) followed by Peru (US\$102.9 million). Given the fact that the geographical area of Peru is so much smaller than that of Canada, Australia and the United States, the intensity of mineral exploration per unit area in Peru must have exceeded that in Canada, Australia and the United States. The MEG survey indicated that for the commodities they survey, exploration budgets worldwide totaled only US\$1.9 billion, the lowest level since at least 1993.

The MEG survey was for spending intentions for 2002, not amounts actually spent during the year, and the official government exploration surveys for Canada and Australia should ultimately provide a more reliable comparison of exploration spending in those two countries.

Figure 1
Top Three Country Destinations of Mineral Exploration Capital from Worldwide Sources, 1977-2002

Year	Rank		
	First	Second	Third
2002	Canada (?)	Australia (?)	United States
2001	Australia	Canada	United States
2000	Australia	Canada	United States
1999	Australia	Canada	United States
1998	Australia	Canada	United States
1997	Australia	Canada	United States
1996	Australia	Canada	United States
1995	Australia	Canada	United States
1994	Australia	Canada	United States
1993	Australia	Canada	United States
1992	Australia	Canada	United States
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1986	Canada	Australia	United States
1985	Canada	Australia	United States
1984	Canada	Australia	United States
1983	Canada	Australia	United States
1982	Canada	Australia	United States
1981	Canada	Australia	United States
1980	Australia	Canada	United States
1979	Australia	United States	Canada
1978	Australia	United States	Canada
1977	United States	Canada	Australia

Source: Natural Resources Canada, based on official Canadian and Australian statistics and the best available data for the United States. Data for 2002 based on the Metals Economics Group survey for 2002.

Notes: Australian expenditures were 6.5% higher than those for Canada in 1983 and 3.3% higher in 1991; however, correcting the reported Australian totals for substantial mine development expenditures, which are not included in Canadian statistics, ranks Canada first in 1983 and 1991. Complete data are not available for the former Soviet Union and China.

Still, there are difficulties in comparing even the official Canadian and Australian exploration surveys as follows (see Table 1):

- The Canadian survey is for calendar years (January 1-December 31), while the Australian survey is for fiscal years (July 1-June 30).
- The Canadian survey is in Canadian dollars while the Australian survey is in Australian dollars and the relative values of these currencies are constantly changing.
- Until 1997, the Canadian survey did not include exploration performed at producing mines but, rather, only exploration for separate new orebodies on the properties surrounding producing mines (that is, new orebodies that would actually be mined from a separate new mine). The Australian survey has always included exploration in producing mines. Modifications to the Canadian exploration survey beginning with survey year 1997 include some exploration in areas of certain producing mines for completely new orebodies widely separated from existing ore zones.
- At the time of writing this chapter, the most recent Australian survey covers fiscal year 2001/02 and, therefore, includes only half (to June 30, 2002) of the calendar year 2002 covered by the MEG survey. Until the Australian survey data for fiscal year July 1, 2002, to June 30, 2003, become available later in 2003, it will not be possible to make a meaningful comparison of actual Australian and Canadian exploration expenditures for 2002.

Table 1 represents a comparison, in Canadian dollars, of exploration expenditures in Canada and Australia for calendar years and fiscal years from 1996 to 2002. For Australian fiscal year 2001/02, exploration expenditures in Canada have been calculated to be about C\$523.5 million (the average of expenditures in Canada in 2001 and 2002), compared to C\$526 million in Australia, amounts that are almost equal.

DIAMONDS

Exploration for diamonds continues on many Canadian properties. In Ontario, De Beers Canada Exploration Inc. has a feasibility study under way for the Victor kimberlite (37 Mt containing diamonds worth about C\$94/t) some 90 km west of James Bay. De Beers is also exploring three of seventeen adjacent kimberlites.

In the Fort-à-la-Corne area in Saskatchewan, a number of mini-bulk samples, with a total weight of 1271.9 t, have been taken by De Beers from the 140/141 kimberlite (Kensington Resources Ltd., 42.5%; De Beers, 42.5%; Cameco Corporation, 5.5%; and UEM Inc 10% carried interest). The diamond-bearing heavy mineral concen-

trates recovered have been shipped to De Beers Consolidated Mines Limited in Johannesburg for diamond recovery and evaluation. The kimberlite size is estimated to exceed 500 Mt. The largest diamond recovered to date is a gem-quality 3.335-ct stone.

At Jackson Inlet, Nunavut, near the northern end of Baffin Island, Twin Mining Corporation continues to explore the Freightrain kimberlite. Mini-bulk samples taken from test pits in 2002 ranging from 2.5 to 76.3 t in size, with a total weight of 228.19 t, yielded 46.206 ct of diamonds of which the 30 largest are of gem quality and range from 0.25 to 1.557 ct.

In the Ungava peninsula of northern Quebec, Twin Mining is exploring a diamondiferous kimberlite dyke system that is up to 2.3 m wide over an outcrop strike length of 37 km. A total of 1.01 t of grab samples taken in 2002, from 900-m and 400-m dyke segments, had average diamond contents of 0.3 ct/t. The five largest diamonds, recovered from a 342-t bulk sample taken in 2001/02, weigh 0.685, 0.566, 0.279, 0.271 and 0.199 ct.

At the Gahcho Kué project, also known as Kennady Lake, located on the AK claim block, a joint venture of De Beers (51%), Mountain Province Diamonds Inc. (44.1%) and Camphor Ventures Inc. (4.9%), a total of 1174 ct of diamonds were recovered from a 665.5-t kimberlite bulk sample taken from five 24-inch-diameter drill holes in the northern lobe of the Hearne pipe. The three largest diamonds recovered weigh 8.7, 6.4 and 4.9 ct. The number of diamonds greater than half a carat (157) is proportionately 31% greater than in a 2001 bulk sample and 15% greater than in a 1999 bulk sample from the same kimberlite.

An 836-t bulk sample from the 5034 diamond pipe yielded 1215 ct with the largest diamonds recovered weighing 7.0, 6.6 and 5.9 ct. A significantly higher proportion of diamonds weighing greater than one carat were recovered in 2002 compared to the 1999 and 2001 bulk samples.

The diamonds recovered from the Hearne and 5034 pipes in 2002 have been sent for valuation.

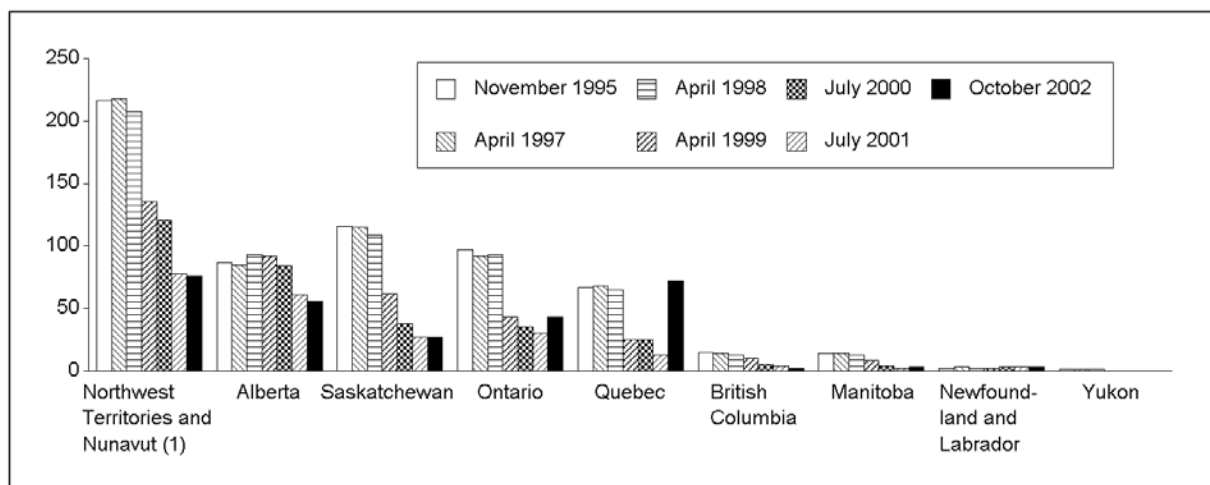
During 2002, additional exploration drilling was carried out on the nearby Tuzo pipe (indicated and inferred resource of approximately 15 Mt).

In October 2002 there were some 300 other diamond exploration or diamond deposit appraisal properties in Canada (Figure 2).

EMERALDS

In the southeastern Yukon, True North Gems Inc. is exploring the Regal Ridge emerald deposit in the Pelly Mountains, 230 km northeast of Whitehorse. Exploration over the 2001 and 2002 field seasons has uncovered eight

Figure 2
Regional Distribution of Diamond Exploration and Deposit Appraisal Properties,
1995-2002



Source: Natural Resources Canada, based on *MIN-MET CANADA* database for 1995-97 and InfoMine database for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

(1) In October 2002 there were 76 in the Northwest Territories and 25 in Nunavut for a total of 101. In July 2001 (2000), there were 78 (112) diamond exploration properties in the Northwest Territories and 10 (9) in Nunavut, for a total of 88 (121) properties in the two territories.

emerald/tourmaline vein systems in the main zone and three additional zones (the Far West, West and Southwest veins). The emeralds were formed more than 65 million years ago. A 113-t bulk sample, taken in 2002, yielded 65 kg of rough emerald concentrate with an expected value of US\$57 700, which compares favourably with other world-class emerald deposits. The emerald-bearing material was sorted into three categories: gem quality, near-gem quality and non-gem quality. Gem-quality cut emeralds from the property, viewed by the author in March 2003 at the Annual Conference of the Prospectors and Developers Association of Canada, were highly attractive but none of them were of large size. The Yukon emeralds are reported to be chromium-based emeralds, which means that they are fluorescent and have higher value than the less precious vanadium-based emeralds, which merely reflect green light.

OTHER MINERAL COMMODITIES

In Nunavut, Miramar Mining Corporation continued exploration drilling on its Hope Bay gold property. A feasibility study for the Doris North area was positive and the company is in the process of permitting a 690-t/d operation to mine, mill and recover 311 000 oz of gold over a two-year period. At present, measured and indicated resources at the Hope Bay property contain 1 636 000 oz of gold, with an additional 2 703 000 oz contained in inferred resources. A major exploration program is

planned for the Hope Bay project in 2003. Production is planned for early 2005.

Also in Nunavut, Cumberland Resources Ltd. continues exploration of its Meadowbank gold project. A feasibility study is under way and scheduled to be completed in late 2003. A preliminary assessment indicates that the project could support annual production of 250 000 oz of gold over an eight-year mine life at an estimated cash cost of US\$168/oz. Exploration expenditures of C\$10.3 million are planned for 2003.

A third exploration project in Nunavut is the Starfield Resources Inc. Ferguson Lake project, which is exploring a copper-nickel-PGM deposit, originally discovered in 1952 by Inco Limited. Resources now stand at 60 Mt averaging 0.59% nickel, 0.93% copper, 1.32 g/t palladium and 0.19 g/t platinum, up from the 7.3 Mt averaging 0.80% nickel and 0.70% copper established by Inco in the 1950s. Tests of dense media separation methods are yielding a sink fraction with a recovered grade of 20 g/t platinum plus palladium from a head grade of 3.13 g/t platinum plus palladium. Recoveries in the sink fraction are 83% of the platinum and 74% of the palladium, with an 88% weight rejection.

At Sudbury, Ontario, FNX Mining Company Inc. (75%) and Dynatec Corporation (25%) are exploring former producing mining properties of Inco Limited (McCreeley West, Victoria, Norman, Levack and Kirkwood) under an agreement whereby they can purchase these properties

(Inco retains the right to buy back a 51% interest in any deposit discovered that contains in excess of 600 million lb of nickel equivalent by carrying the 49% remaining FNX-Dynatec ownership share through to production).

Some 15 diamond drills completed 350 000 feet of drilling at the former McCreedy West mine in the last nine months of 2002. More than 2 million short tons of relatively high-grade resources have been outlined at McCreedy West with potential for additional resources at depth, and production at an initial rate of 907 t/d is planned for 2003.

Attractive intersections have also been obtained on the Norman and Victoria properties where exploration continues.

In Saskatchewan, Cameco Corporation announced the discovery of the Millenium uranium deposit (actually discovered in 2000) at a depth of 600 m below surface. The tonnage and grade of the deposit have not been released.

In British Columbia, ongoing exploration on the Kemess property outlined an additional 2 million oz of gold and 227 000 t of copper in the Kemess North deposit and the newly discovered Nugget zone. A feasibility study is in progress with the intent of providing mill feed for the concentrator after the Kemess South orebody has been mined out.

DRC Resources Corporation continued exploration on its Afton copper-gold project where a zone below and to the southwest of the former Afton mine open pit has been estimated to contain 38.4 Mt at a grade of 2.32% copper equivalent, over a length of 1000 metres, with the deposit open to the southwest and northeast. A scoping study by Behre Dolbear & Company Inc. suggests that a 4080-t/d underground block caving operation could yield a 32.3% internal rate of return. A pre-feasibility study is in progress and diamond drilling of the deposit continues.

Notes: (1) Information in this review was current as of May 2003. (2) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/2002cmy_e.htm.

NOTE TO READERS

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TABLE 1. EXPLORATION EXPENDITURES, CANADA AND AUSTRALIA, 1996-2002

Year	Canada	Australia		(C\$ million)
	Calendar Year	Fiscal year		
	(C\$ millions)	(A\$ millions)	(Avg. Exchange Rate A\$/C\$)	
1996	894.8			
1996-97	857.5 (average of 1996 & 1997)	1 148.50	1.0700	1229.00
1997	820.2			1129.00
1997-98	698.0 (average of 1997 & 1998)	1 066.80	0.9642	1029.00
1998	575.9			911.50
1998-99	540.1 (average of 1998 & 1999)	837.80	0.9475	794.00
1999	504.3			710.00
1999-2000	501 (average of 1999 & 2000)	676.30	0.9258	626.00
2000	496.7			591.50
2000-2001	505 (average of 2000 & 2001)	683.30	0.8158	557.00
2001	512.9			546.50
2001-02	523.5 (average of 2001 & 2002)	640.60	0.8217	526.00
2002	(p) 534.1			

Source: Natural Resources Canada.
(p) Preliminary.